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Intermountain Power Project
Intermountain Generating Station
Fugitive Dust Emissions System Analysis

B&V Project 9255
B&V File 42.1206
October 13, 1982

Mr. James H. Anthony, Project Manager
Intermountain Power Project
Department of Water and Power
General Office Building, Room 931
P. O. Box 111, T. A.
Los Angeles, California 90051

Attention: Mr. Jack Hayashi, Project Engineer

Gentlemen:

This letter describes preliminary air quality modeling results for the Intermountain Generating Station. This information was requested by Tim Conkin during a telephone conversation (9/23/82) with Black & Veatch's Dan Nelson.

The 24-hour predicted concentrations are presented for three sets of coal characteristics: the maximum conditions for the weighted average coal, a typical A/F coal blend, and the maximum conditions for an A/F coal blend. The maximum conditions consist of low heating value, high ash, and high sulfur content. The typical and range values for the various coals are given in Table 1.

Table 2 lists the proposed 24-hour emission factor equations, assumed parameters, and emission factors. Table 3 lists the mitigative measures and control efficiencies assumed for the analysis. Table 4 lists the modeled sources, controlled emissions, basis for determining the fugitive emissions, and daily emissions. The daily emissions are based on four units operating at MCR.

Some potential fugitive dust sources were not included in the preliminary modeling because of the relatively small quantity of emissions expected. Stockout, reclaim, and wind erosion from the emergency and reserve coal stockout piles will be reduced when atmospheric conditions are unfavorable. The relatively small quantity of lime that will be utilized during plant operation will be handled pneumatically and stored in silos virtually eliminating lime fugitive dust.

Intermountain Power Project
Mr. Jack Hayashi

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The fugitive dust emissions from the waste disposal area should be minimal. The stored material will initially contain about 25 per cent water and will be a combination of dewatered scrubber sludge, fly ash, and possibly lime. The lime would be used to stabilize and strengthen the mixture. The area of active landfill operation will be limited, to also minimize the fugitive dust problem. The hauling of waste by trucks would be the major source associated with this area and was modeled.

The various topsoil and excess overburden storage areas were not modeled. These areas should either not exist or will be stabilized prior to full plant operation. Therefore, wind erosion of these areas is not expected to be significant.

Table 4 presents the highest combined offsite particulate concentrations based on the three coal types. Only the 24-hour impacts are presented since the 24-hour Prevention of Significant Deterioration (PSD) increment is the most restrictive. As noted in Table 5, the predicted concentrations are less than 75 per cent of the 24-hour PSD increment of 37 micrograms per cubic metre. Table 6 presents the highest individual concentration for each source and coal characteristic.

To establish a complete particulate impact, the emissions from the two chimneys were modeled. They were modeled using the parameters listed in H. E. Cramer's report entitled, "Calculated Air Quality Impact of Emissions from the IPP Power Plant For the Revised Stack Configuration" dated June 1981. For completeness, parameters are repeated in Table 7.

The preliminary modeling of the two chimneys resulted in the same relative location of the maximum concentrations but a lower value than calculated in the H. E. Cramer study. The source parameters were the same but different air quality models were used. There are several model differences which may have caused the difference in concentrations but no investigation into specific reasons was made since the chimneys are not expected to be major contributors at the combined maximum impact location.

If there are any questions concerning the above items, please call Dan Nelson (913-967-2152). We plan to issue a preliminary final draft before the end of October. Early receipt of any comments would be appreciated.

Very truly yours,

BLACK & VEATCH

P. F. Bannister for

P. F. Bannister

cc: Charlotte Welty
Tim Conkin
Steve Clark

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Attachments

TABLE 1. COAL CHARACTERISTICS

<u>Characteristics</u>	<u>Weighted Average Coal</u>	<u>Blend of A/F Coal*</u>
Heating Value (Btu/lb)		
Typical	11,410	10,296
Range	10,917-11,994	9,690-10,943
Per Cent Ash		
Typical	11.1	11.7
Range	6.95-13.6	7.5-16.8
Per Cent Sulfur		
Typical	0.65	0.84
Range	0.41-0.84	0.70-1.01
Maximum Fuel Flow (ton/h)		
Typical	344.8	381.5
Range	327.7-361.2	359.0-405.4

*50/50 mixture by weight.

TABLE 2. THE PROPOSED 24-HOUR EMISSION FACTOR EQUATIONS AND ASSUMED INPUT PARAMETERS

Source	Emission Factor Equation	Assumed Parameters	Emission Factor*
Coal Pile Wind Erosion (Inactive) (1b/year) acre	$3,400 \frac{(e/50)(s/15)(f/25)}{(0.03 PE)^2}$	e = 47 tons/acre/year s = 7.7 per cent f = 100 per cent PE = 21	4.25 $\frac{lb/hr}{acre}$
Coal Pile Wind Erosion (Active) (kg/t)**	$0.025(s/1.5)(d/235)(f/15)(D/90)$	s = 7.7 per cent d = 275 days f = 100 per cent D = 7 days	0.16 lb/ton (0.08 kg/t)**
Coal Stockout (kg/t)**	$0.00009 \frac{(s/5)(u/2.2)(H/3)}{(0.5 M)^2 (Y/4.6)}$	s = 7.7 per cent u = 13 m/sec H = 3 m M = 2.8 per cent Y = 4.6 m ³	0.008 lb/ton (0.004 kg/t)**
Coal Unloading (railcar) (kg/t)**	$0.0009 \frac{(s/5)(u/2.2)(H/1.5)}{(0.5 M)^2 (Y/4.6) 1/3}$	s = 7.7 per cent u = 13 m/sec H = 3 m M = 2.8 per cent Y = 110 m ³	0.0058 lb/ton (0.0029 kg/t)**
Coal Unloading (truck) (kg/t)**	$0.0009 \frac{(s/5)(u/2.2)(H/1.5)}{(0.5 M)^2 (Y/4.6) 1/3}$	s = 7.7 per cent u = 13 m/sec H = 1 m M = 2.8 per cent Y = 45 m ³	0.0026 lb/ton (0.0013 kg/t)**
Coal Crushing (grain/cu ft)	—	—	Outlet loading of Baghouse 0.02 grain/cu ft***

*Uncontrolled emission factor unless noted.

**Kilogram per metric ton.

***Controlled emission factor.

TABLE 2 (Continued). THE PROPOSED 24-HOUR EMISSION FACTOR EQUATIONS AND ASSUMED INPUT PARAMETERS

<u>Source</u>	<u>Emission Factor Equation</u>	<u>Assumed Parameters</u>	<u>Emission Factor*</u>
Coal Conveying (lb/ton)	$0.002 \frac{\text{kg}}{\text{t}}$ conveyor	--	0.02 lb/ton**
Coal Transfer (lb/ton)	--	--	0.10 lb/ton**
Limestone Stockout (kg/t)***	$\frac{0.0009 (s/5)(u/2.2)(H/3)}{(0.5 M)^2 (Y/4.6)}$	$s = 0.4 \text{ per cent}$ $u = 13 \text{ m/sec}$ $H = 3 \text{ m}$ $M = 0.8 \text{ per cent}$ $Y = 4.6 \text{ m}^3$	0.005 lb/ton (0.0027 kg/t)***
Limestone Reclaim (kg/t)***	$\frac{0.0009 (s/5)(u/2.2)}{(0.5 M)^2 (Y/4.6)}$	$s = 0.4 \text{ per cent}$ $u = 13 \text{ m/sec}$ $M = 0.8 \text{ per cent}$ $Y = 4.6 \text{ m}^3$	0.005 lb/ton (0.0027 kg/t)***
Limestone Unloading (truck) (kg/t)***	$\frac{0.0009 (s/5)(u/2.2)(H/1.5)}{(0.5 M)^2 (Y/4.6)1/3}$	$s = 0.4 \text{ per cent}$ $u = 13 \text{ m/sec}$ $H = 3 \text{ m}$ $M = 0.8 \text{ per cent}$ $Y = 16 \text{ m}^3$	0.007 lb/ton (0.0035 kg/t)***
Limestone Pile Wind Erosion (Inactive)	--	Assumed to be same as the corresponding coal factor.	4.25 $\frac{\text{lb/h}}{\text{acre}}$
Limestone Pile Wind Erosion (Active)	$0.025(s/1.5)(d/235)(f/15)(D/90)$	$s = 0.4 \text{ per cent}$ $u = 13 \text{ m/sec}$ $d = 275 \text{ days}$ $D = 1 \text{ day}$	0.0012 lb/ton (0.0006 kg/t) through storage

*Uncontrolled emission factor unless noted.

**Total emission factor for multiple individual sources.

***Kilogram per metric ton.

TABLE 2 (Continued). THE PROPOSED 24-HOUR EMISSION FACTOR EQUATIONS AND ASSUMED INPUT PARAMETERS

<u>Source</u>	<u>Emission Factor Equation</u>	<u>Assumed Parameters</u>	<u>Emission Factor*</u>
Limestone Crushing/Transfer	--	Assumed to be same as the corresponding coal factor.	0.10 lb/ton**
Limestone Conveying	--	Assumed to be same as the corresponding coal factor.	0.02 lb/ton
Fly Ash Silo Vent	--	--	Outlet loading of Baghouse 0.02 grain/cu ft**
Fly Ash Silo Unloading (kg/t)***	$0.0009 \frac{(s/5)(u/2.2)(H/1.5)}{(0.5 M)^2 (Y/4.6) 1/3}$	$s = 100 \text{ per cent}$ $u = 13 \text{ per cent}$ $H = 1.5 \text{ m}$ $M = 25 \text{ per cent}$ $Y = 4.6 \text{ m}^3$	0.0014 lb/ton*** (0.0007 kg/t)***
Haul Roads (kg/vehicle km)	$0.23(s)(S/48)(d/365)(F)$	$s = 7.3 \text{ per cent}$ $S = 32 \text{ km/h (20 mph)}$ $d = 275 \text{ days}$ $F = 2$	6 lb/vehicle mile (1.69 kg/vehicle km)

*Uncontrolled emission factor unless noted.

**Controlled emission factor.

***Kilogram per metric ton.

train movement around the rail loop

TABLE 2 (Continued). THE PROPOSED 24-HOUR EMISSION FACTOR EQUATIONS AND ASSUMED INPUT PARAMETERS

Legend:

- A Surface area (acres).
- D Average pile turnover time (days).
- d Annual mean number of days in which precipitation was below 0.01 inches.
- e Erodibility (tons/acre/year).
- f Percentage of time during a year in which wind speed exceeds miles per hour.
- F Enhancement factor (2.5 for coal mines).
- H Height of release of material.
- M Moisture content (percentage of unbound surface moisture).
- PE Thornthwaite's precipitation-evaporation index.
- s Silt content (percentage of particles less than 75 microns in diameter).
- S Average vehicle speed.
- u Mean wind speed.
- Y Average volume of batch material transferred (usually dump device capacity).

TABLE 3. CONTROL EFFICIENCIES FOR FUGITIVE DUST SOURCES

<u>Fugitive Dust Source</u>	<u>Control Efficiency per cent</u>	<u>Method</u>
Coal Pile Wind Erosion	90	Crusting plus compaction
Coal Stockout	75	Stacker
Coal Unloading (railcar)	99.8	Partial enclosure plus fabric filters
Coal Unloading (truck)	0	None
Coal Reclaim	100	Rotary plows beneath piles
Coal Crushing	99+	Enclosure plus fabric filters
Coal Conveying	90	Enclosed
Coal Transfer	99	Enclosure plus fabric filters
Limestone Stockout	75	Telescopic chute
Limestone Reclaim	90	Gravity feed beneath pile
Limestone Unloading (truck)	0	None
Limestone Pile Wind Erosion	90	Crusting plus compaction
Limestone Crushing/Transfer	99.8	Enclosure plus fabric filters
Limestone Conveying	90	Enclosed
Fly Ash Silo (Vent)	99+	Enclosure plus fabric filters
Fly Ash Silo Unloading	99+	Mixing with scrubber sludge (25 per cent water)
Haul Roads	75	Watering

TABLE 4. FUGITIVE DUST EMISSIONS BY COAL TYPE

Fugitive Dust Sources	Controlled Emission Factor	Maximum Weighted Average Coal Basis Emissions		Typical A/F Coal Blend Basis Emissions		Maximum A/F Coal Basis Emissions
		Basis	Emissions	Basis	Emissions	
Reserve Coal Pile Wind Erosion	0.425 lb/h acre	45 acres	459 lb/day	45 acres	459 lb/day	45 acres
Short-Term Coal Pile Wind Erosion	0.425 lb/h acre	10 acres	102 lb/day	10 acres	102 lb/day	10 acres
Active Coal Pile Wind Erosion	0.016 lb/ton	2.4 x 10 ⁶ ton/yr*	105 lb/day	2.4 x 10 ⁶ ton/yr	105 lb/day	2.4 x 10 ⁶ ton/yr
Coal Stockout	0.004 lb/ton	18,500 ton/day**	74 lb/day	18,500 ton/day**	74 lb/day	18,500 ton/day**
Coal Unloading						
Railcar	1.2 x 10 ⁻⁶ lb/ton	25,200 ton/day	0.3 lb/day	25,200 ton/day	0.3 lb/day	25,200 ton/day
Truck	0.0026 lb/ton	2,300 ton/day	6 lb/day	2,300 ton/day	6 lb/day	2,300 ton/day
Haul Road (Coal)	1.5 lb/mile	58 trips/day @ 3 miles	261 lb/day	58 trips/day @ 3 miles	261 lb/day	58 trips/day @ 3 miles
Coal Crushing	0.02 grain/ft ³	31,900 cfm @ 18 h/day	98 lb/day	31,900 cfm @ 19 h/day	104 lb/day	31,900 cfm @ 20 h/day
Coal Conveying	0.0002 lb/ton	35,000 ton/day	70 lb/day	37,000 ton/day	74 lb/day	39,000 ton/day
Coal Transfer	0.001 lb/ton	35,000 ton/day	35 lb/day	37,000 ton/day	37 lb/day	39,000 ton/day
Reserve Limestone Pile Wind Erosion	0.425 lb/hr acre	3 acres	31 lb/day	3 acres	31 lb/day	3 acres

*Material put through storage.

**9,000 tons sent directly to units.

TABLE 4 (Continued). FUGITIVE DUST EMISSIONS BY COAL TYPE

Fugitive Dust Sources	Controlled Emission Factor	Maximum Weighted Average Coal Emissions Basis		Typical A/F Coal Blend Emissions Basis		Maximum A/F Coal Blend Emissions Basis						
		Active Limestone	Stockout	Rec-lain	Wind Erosion	Wind Unloading (Truck)	Haul Road (Limestone)	Limestone Crushing/Transfer	Limestone Conveying	Fly Ash Silo Vents	Fly Ash Silo Unloading	Haul Road (Solid Waste)
Active Limestone	0.0013 lb/ton	1,400 ton/day	1.9 lb/day	1,400 ton/day	1.9 lb/day	1,400 ton/day	1.9 lb/day	1,400 ton/day	1,400 ton/day	0.2 lb/day	1,400 ton/day	1.9 lb/day
Stockout	0.0005 lb/ton	1,000 ton/day	0.5 lb/day	1,100 ton/day	0.6 lb/day	1,400 ton/day	0.6 lb/day	1,400 ton/day	1,400 ton/day	0.7 lb/day	1,400 ton/day	0.7 lb/day
Rec-lain	12×10^{-6} lb/ton	179,000 ton/yr*	0.6 lb/day	179,000 ton/yr*	0.6 lb/day	179,000 ton/yr*	0.6 lb/day	179,000 ton/yr*	179,000 ton/yr*	0.6 lb/day	179,000 ton/yr*	0.6 lb/day
Wind Erosion												
Wind Unloading (Truck)	0.007 lb/ton	1,400 ton/day	10 lb/day	1,400 ton/day	10 lb/day	1,400 ton/day	10 lb/day	1,400 ton/day	1,400 ton/day	10 lb/day	1,400 ton/day	10 lb/day
Haul Road (Limestone)	1.5 lb/mile	58 trips/day @ 3 miles	261 lb/day	58 trips/day @ 3 miles	261 lb/day	58 trips/day @ 3 miles	261 lb/day	58 trips/day @ 3 miles	58 trips/day @ 3 miles	261 lb/day	58 trips/day @ 3 miles	261 lb/day
Limestone Crushing/Transfer	0.0002 lb/ton	1,000 ton/day	0.2 lb/day	1,100 ton/day	0.2 lb/day	1,400 ton/day	0.2 lb/day	1,400 ton/day	1,400 ton/day	0.3 lb/day	1,400 ton/day	0.3 lb/day
Limestone Conveying	0.002 lb/ton	1,000 ton/day	2 lb/day	1,100 ton/day	2 lb/day	1,400 ton/day	2.2 lb/day	1,400 ton/day	1,400 ton/day	2.8 lb/day	1,400 ton/day	2.8 lb/day
Fly Ash Silo Vents	0.02 grain/ft ³	10,000 ft ³ /min	41 lb/day	9,000 ft ³ /min	37 lb/day	19,250 ft ³ /min	37 lb/day	19,250 ft ³ /min	19,250 ft ³ /min	79 lb/day	19,250 ft ³ /min	79 lb/day
Fly Ash Silo Unloading	0.0014 lb/ton	3,750 ton/day	5.3 lb/day	3,260 ton/day	4.6 lb/day	5,230 ton/day	4.6 lb/day	5,230 ton/day	5,230 ton/day	7.3 lb/day	5,230 ton/day	7.3 lb/day
Haul Road (Solid Waste)	1.5 lb/mile	80 trips/day @ 4.6 miles	552 lb/day	75 trips/day @ 4.6 miles	518 lb/day	110 trips/day @ 4.6 miles	518 lb/day	110 trips/day @ 4.6 miles	110 trips/day @ 4.6 miles	759 lb/day	110 trips/day @ 4.6 miles	759 lb/day

*Material put through storage.

TABLE 5. MAXIMUM COMBINED OFFSITE PARTICULATE CONCENTRATIONS

Source	24-Hour Concentrations ($\mu\text{g}/\text{m}^3$)		
	Maximum Weighted Average Coal	Typical Blend of A/F Coal	Maximum Blend of A/F coal
Waste Disposal Haul Road	<0.1	<0.1	<0.1
Coal/Limestone Haul Road	0.2	0.2	0.2
Reserve Coal	<0.1	<0.1	<0.1
Short-Term Coal	8.4	8.4	8.4
Active Coal (Stacker/Reclaimer)	0.4	0.4	0.4
Active Coal (Stacker/Rotary Plow)	13.3	13.3	13.3
Coal Unloading (Train)	<0.1	<0.1	<0.1
Coal Unloading (Truck)	<0.1	<0.1	<0.1
Coal Crushing	3.5	3.7	3.9
Coal Conveying/Transfer	0.1	0.1	0.1
Reserve Limestone	<0.1	<0.1	<0.1
Active Limestone	<0.1	<0.1	<0.1
Limestone Unloading (Truck)	<0.1	<0.1	<0.1
Limestone Crushing/Transfer	<0.1	<0.1	<0.1
Limestone Conveying	<0.1	<0.1	<0.1
Fly Ash Vents	0.3	0.3	0.5
Fly Ash Unloading	<0.1	<0.1	<0.1
Both Chimneys	<0.1	<0.1	<0.1
Total	26.2	26.4	26.9
Per Cent of PSD Increment	73	71	73

TABLE 6. MAXIMUM INDIVIDUAL OFFSITE PARTICULATE CONCENTRATIONS*

Source	24-Hour Concentrations		
	Maximum Weighted Average Coal µg/m ³	Typical Blend of A/F Coal µg/m ³	Maximum Blend of A/F Coal µg/m ³
Waste Disposal Haul Road	7.8	7.3	10.8
Coal/Limestone Haul Road	5.6	5.6	5.6
Reserve Coal	10.5	10.5	10.5
Short-Term Coal	8.4	8.4	8.4
Active Coal (Stacker/Reclaimer)	6.6	6.6	6.6
Active Coal (Stacker/Rotary Plow)	19.3	19.3	19.3
Coal Unloading (Train)	<0.1	<0.1	<0.1
Coal Unloading (Truck)	0.1	0.1	0.1
Coal Crushing	3.5	3.7	3.9
Coal Conveying/Transfer	1.8	1.9	2.1
Reserve Limestone	0.5	0.5	0.5
Active Limestone	<0.1	0.1	0.1
Limestone Unloading (Truck)	0.2	0.2	0.2
Limestone Crushing/Transfer	<0.1	<0.1	<0.1
Limestone Conveying	<0.1	<0.1	<0.1
Fly Ash Vents	0.4	0.3	0.7
Fly Ash Unloading	0.1	0.1	0.1

*Concentrations are not necessarily at the same locations.

TABLE 7. MODELED CHIMNEY PARAMETERS

<u>Parameter</u>	<u>Chimney for Units 1 and 2</u>	<u>Chimney for Units 3 and 4</u>
Stack Height	216 m	216 m
Stack Inner Diameter	12.1 m	12.1 m
Stack Exit Velocity	20.7 m/sec	20.7 m/sec
Stack Exit Temperature	330 K	330 K
Particulate Emission Rate	37.4 g/sec	37.4 g/sec